

CLAIMS

What is claimed is:

- 5 1. A method of forming a deposit on a substrate comprising the steps of:
 providing an organic solution with a desired deposition component;
 providing a deposition substrate;
 seeding the deposition substrate with a seed composition comprising a more noble
10 composition than a less noble deposition substrate; and
 depositing the desired deposition component from the organic solution onto the
 substrate to form a seed composition or film.
- 15 2. The method of claim 1 wherein the seed composition comprises at least one material
 selected from the group consisting of a metal, metal alloy, and metal containing compound.
- 20 3. The method of claim 2 wherein the seed composition comprises a member selected
 from the group consisting of copper, platinum, palladium, gold, zinc, iron, cadmium, silver, lead, cobalt,
 nickel, and mixtures thereof.
4. The method of claim 1 wherein the deposition component comprises at least one
 material selected from the group consisting of a metal, a metal alloy, a metal compound, a metal ion,
 and an organometallic complex.
- 25 5. The method of claim 4 wherein the deposition component comprises a member selected
 from the group consisting of copper, gold, platinum, palladium, silver, lead, zinc, tin, nickel, iron, and
 mixtures thereof.

6. The method of claim 5 wherein the barrier layer metal comprises at least one material selected from the group consisting of a metal nitride, a metal silicate, a metal combination and a non-metal combination.

5 7. The method of claim 1 wherein the deposition component comprises at least one material selected from the group consisting of an ion, and a neutral molecule.

8. The method of claim 1 wherein the deposition substrate comprises at least one material selected from the group consisting of a metal and a non-metal.

10 9. The method of claim 8 wherein the deposition substrate comprises at least one composition selected from the group consisting of tungsten-based, tantalum-based, titanium-based and any other less noble compositions.

15 10. The method of claim 9 wherein said deposition substrate comprises at least one material selected from the group consisting of Ti, Ta, W, TiN, TaN, W₂N, TiSiN, WN, WSiN and TaSiN.

11. The method of claim 1 wherein said deposition substrate comprises at least one material selected from the group consisting of copper, nickel, iron, aluminum, steel, zinc and silver.

20 12. The method of claim 1 wherein the seed composition comprises at least one non-metallic element.

25 13. The method of claim 1 wherein the organic solution comprises at least two deposition components.

14. The method of claim 1 where the deposition substrate comprises a barrier layer.

15. The method of claim 1 further comprising the step of treating the deposition substrate.

5 16. The method of claim 15 wherein the treating step comprises introducing a halogenated compound into the organic solution.

17. The method of claim 16 wherein the halogenated and non-halogenated compound comprises at least one member selected from the group consisting of HBF_4 , HF , NaF , H_2SiF_6 , and HCl .

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18. The method of claim 15 wherein the treating step comprises introducing a non-halogenated compound into the organic solution.

19. The method of claim 18 wherein the non-halogenated compound comprises H_2SO_4 .

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20. The method of claim 15 wherein the treating step comprises introducing at least one material selected from the group consisting of an acid and a base into the organic solution.

21. The method of claim 15 wherein the step of treating the deposition substrate comprises etching the substrate.

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22. The method of claim 21 wherein the step of etching the substrate comprises pre-etching the substrate prior to the deposition step.

23. The method of claim 21 wherein the step of etching the substrate comprises *in-situ* etching of the substrate during the deposition step.

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24. The method of claim 1 wherein the organic solution is a single phase solution.

25. The method of claim 1 wherein the organic solution is a two-phase solution.

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26. The method of claim 1 wherein the organic solution comprises a solvating extractant.

27. The method of claim 1 wherein the organic solution comprises a cation exchange
reactant.

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28. The method of claim 1 wherein the organic solution comprises a chelating extractant.

29. The method of claim 1 wherein the organic solution comprises an anion exchange
extractant.

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30. The method of claim 1 wherein the organic solution comprises a diluent.

31. The method of claim 1 wherein the organic solution comprises, in combination with a
diluent, at least one extractant selected from the group consisting of solvating extractants, cation
exchange reactants, chelating extractants, anion exchange extractants, and mixtures thereof.

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32. The method of claim 31 wherein said diluent comprises at least one inert compound
selected from the group consisting of kerosene (aliphatic), rykue (aromatic), napthene (napthenic), other
commercially available compounds, and mixtures thereof.

33. The method of claim 1 further comprising the step of mixing or agitating the organic solution.

5 34. The method of claim 33 wherein the mixing comprises ultrasonic agitation.

35. The method of claim 1 wherein the organic solution further comprises the step of adding at least one additive.

10 36. The method of claim 35 wherein the additive comprises at least one member selected from the group consisting of organics, inorganics, acids, bases, salts, and mixtures thereof.

37. The method of claim 36 wherein the organic additive comprises at least one component selected from the group consisting of alcohols, alkyl halides, ethers, carboxylic acids, aldehydes, ketones, amines, carbanions, phenols, amino acids, proteins, carbohydrates, sulfonated organics, and mixtures thereof.

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38. The method of claim 36 wherein the inorganic additive comprises at least one component selected from the group consisting of water, acids, bases, activating cations, activating anions, and mixtures thereof.

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39. The method of claim 1 wherein the step of depositing comprises using two galvanic half-cell reactions.

25 40. The method of claim 1 comprising simultaneous galvanic coating.

41. The method of claim 1 comprising separate galvanic coating.

42. The method of claim 1 further comprising the step of loading the organic solution with the desired deposition component.

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43. The method of claim 1 further comprising the step of transporting reacting species.

44. The method of claim 1 further comprising the step of using temperatures from ambient to elevated levels.

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45. The method of claim 1 further comprising the step of elevating the pressure.

46. The method of claim 1 wherein the depositing step comprises electrochemically depositing the desired deposition component onto the substrate or seed composition.

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47. The method of claim 1 wherein the depositing step comprises reducing the deposition component at a cathodic site by an electrochemical reaction.